New trends in pathogenic *Escherichia coli* in pigs, chickens, and cattle

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Global APZEC Project

**E. coli profile**
- Virulence genes
- Antimicrobial resistance and genes
- O type, phylogenetic type, pulse type

**Demographic data**
- Animal species
- Time of collection
- Animal age
- Geographical location

**Diagnosis**
- Clinical signs
- Histopathological lesions
Sample → Enrichment → Multiplex PCR
APZEC pathotype
• Virulence genes
Positive isolates colonies
• Virotype • O serotype • Antimicrobial resistance
APZEC strain collection
APZEC database
Data presentation
• Geographical location • Age • Disease • Animal species • Time
**E. coli population**

Sub-sets of clones differentiated by their ability to cause disease

- **Pathogenic**
- **Potentially pathogenic**
- **Commensal**

Clone

Clone with resistance gene
Sub-sets of pathogenic *E. coli*
Diseases associated with pathogenic *E. coli* in animals

- **EPEC**
  - Diarrhea

- **STEC**
  - Edema disease
  - Hemorrhagic dysentery

- **ETEC**
  - Diarrhea

- **ExPEC**
  - Extraintestinal infections
Virulence factors of pathogenic *E. coli* in animals

- **EPEC**
  - Eae

- **ExPEC**
  - Aero
  - CNF
  - P
  - Tsh

- **ETEC**
  - LT
  - STa
  - STb

- **STEC**
  - Stx1
  - Stx2
Clinical diagnosis
Added virulence factors tested in animals

- **EPEC**
  - Eae

- **STEC**
  - Stx1
  - Stx2

- **ETEC**
  - F4
  - F5
  - F6
  - F41

- **ExPEC**
  - Aero
  - CNF
  - P
  - Tsh

- **Aero**
  - CNF
  - P
  - Tsh

- **Eae**
  - LT
  - STa
  - STb
Surveillance
Added virulence factors tested in animals

- STEC (Stx1, Stx2)
- EPEC (Eae)
- ETEC (AIDA, Paa, LT, STa, STb, F18, F4, F5, F6, F41, ExPEC, Afa, CNF, Tsh)

Added virulence factors tested in animals
Prevalence of main *E. coli* pathotypes in pigs according to age from 2008 to 2010

Causative agents

Opportunistic agents

Possible agents

% of cases

ETEC:F4
ETEC:F5
ETEC:F18
ETEC:STEC:F18
STEC:F18
EPEC
ETEC:AIDA
ExPEC
Other ETEC
Other STEC

Feedlot
Nursery
Sow barns
Prevalence of main *E. coli* pathotypes in chickens according to age from 2008 to 2010

% of cases

<table>
<thead>
<tr>
<th>Age</th>
<th>ExPEC</th>
<th>EPEC</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 14 days</td>
<td></td>
<td></td>
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<tr>
<td>15-37 days</td>
<td></td>
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<tr>
<td>38-56 days</td>
<td></td>
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<tr>
<td>Unknown</td>
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</table>
Prevalence of main *E. coli* pathotypes in cattle according to age from 2008 to 2010
Centre of Expertise on Animal Pathogenic and Zoonotic *E. coli* (APZEC)

As part of its mandate as OIE Reference Laboratory for *Escherichia coli*, the EcL laboratory has established the Centre of Expertise on Animal Pathogenic and Zoonotic *E. coli* (APZEC). The mission of this centre is to contribute globally to the improvement of animal and public health by becoming an international centre of expertise on *E. coli* affecting animals and humans.

**Overall objectives**

1. Provide training and technical support in the detection of APZEC
2. Develop research projects in partnership with various local institutions
3. Centralize and analyse epidemiological data on APZEC at the national, regional, and international levels
4. Contribute to the dissemination of knowledge pertaining to APZEC

The centre advocates an integrated and ecosystemic approach to the study and surveillance of APZEC at the animal-human-environment interface, with a particular interest in countries of low and middle income where resources for the control of *E. coli* are limited.
Haemolytic ETEC F4 isolates

Non-haemolytic ETEC F4 isolates

2008

STb:EAST1:AIDA:F4
LT:STb:F4
Others
LT:STb:EAST1:F4

2009

LT:STb:F4
Others
LT:STb:EAST1:F4
STb:EAST1:AIDA:F4

2010

LT:STb:F4
Others
LT:STb:EAST1:F4
STb:EAST1:AIDA:F4
Trends in ETEC and STEC F18 virotypes

2008
- Stx2:EAST1:Paa:F18
- Stx2:AIDA:F18
- Stx2:EAST1:AIDA:F18

2009
- Stx2:EAST1:Paa:F18
- Stx2:AIDA:F18
- Stx2:EAST1:AIDA:F18

2010
- LT:STb:Stx2:(EAST1):F18
- Stx2:F18
- Stx2:AIDA:F18
- Stx2:EAST1:AIDA:F18
**ExPEC isolates in pigs, chickens, and cattle**

<table>
<thead>
<tr>
<th></th>
<th>Pig (%) [n=117]</th>
<th>Chicken (%) [n=317]</th>
<th>Cattle (%) [n=75]</th>
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<tbody>
<tr>
<td>Aero</td>
<td>23</td>
<td>14.2</td>
<td>12</td>
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<tr>
<td>Aero:P</td>
<td>9.4</td>
<td>6.0</td>
<td>6.7</td>
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<tr>
<td>Aero:Tsh</td>
<td>17.9</td>
<td>49.5</td>
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<td>Aero:P:Tsh</td>
<td>8.5</td>
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<tr>
<td>P:CNF</td>
<td>9.4</td>
<td>0</td>
<td>0</td>
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<tr>
<td>Tsh</td>
<td>0</td>
<td>2.2</td>
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<tr>
<td>Aero:EAST1</td>
<td>0</td>
<td>3.2</td>
<td>0</td>
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<tr>
<td>Aero:EAST1:Tsh</td>
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<tr>
<td>Aero:EAST1:P</td>
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<td>3.2</td>
<td>5.3</td>
</tr>
<tr>
<td>Aero:P:AFA</td>
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<tr>
<td>Aero:EAST1:P:AFA</td>
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<tr>
<td>Aero:P:AFA:F17</td>
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<td>8</td>
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<tr>
<td>Aero:AFA</td>
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<td>8</td>
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<tr>
<td>Aero:EAST1:AFA</td>
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<td>4</td>
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<tr>
<td>CNF:Aero:F17</td>
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<td>0</td>
<td>4</td>
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<tr>
<td>CNF:EAST1:F17</td>
<td>0</td>
<td>0</td>
<td>2.7</td>
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</table>
Proportion of antimicrobial resistant *E. coli* isolates according to virotype in chickens
Thank you!